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ABSTRACT

This report is the second in a series of Legislative Office of Education Oversight (LOEO) reports focusing on the SchoolNet initiatives. It examines the readiness of Ohio's schools to use the computers and network wiring provided by SchoolNet and SchoolNet Plus. The document is divided into five sections: (1) Introduction; (2) School Readiness for Computers and Networks; (3) Challenges Schools Face as They Prepare To Use Computers and Networks; (4) Strengths of Schools as They Prepare for Computers and Networks; and (5) Conclusions and LOEO Commentary. The LOEO used national literature and data collected during 40 telephone interviews and 12 school visits to identify the strengths schools have, as well as the challenges they face, in preparing for technology. LOEO mailed a questionnaire to a teacher or principal in 500 randomly selected schools. Approximately half (48 percent) of the schools in this sample are ready to use computers and networks and approximately half (52 percent) are not ready. In general, 36 percent of city schools, 44 percent of rural schools, and 65 percent of suburban schools are prepared to use computers and networks. Findings include: approximately 90 percent of the schools not meeting the LOEO criteria for readiness need increased electrical service; for 27 percent of the schools no one is available to repair computer hardware, software, or network equipment; only 7 percent have someone serving their school fulltime; approximately 93 percent of the survey respondents report that teachers want computers for student use; 98 percent of respondents report principals strongly support computers for student use; and 96 percent report strong support by district-level administration. Community support is slightly less--80 percent report a high level of community support. Appendixes include: LOEO telephone interview questions; LOEO criteria for determining readiness; Ohio Department of Education socioeconomic comparison groups; and a sample LOEO questionnaire. (Contains 32 references.) (AEF)

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Ohio SchoolNet Initiatives: School Readiness for Computers and Networks

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The Legislative Office of Education Oversight (LOEO) serves as staff to the Legislative Committee on Education Oversight. Created by the General Assembly in 1989, the Office evaluates education-related activities funded wholly or in part by the state of Ohio. This LOEO report examines the readiness of Ohio schools to use the computers and network wiring provided by the state's SchoolNet initiatives. ***Conclusions and recommendations in this report are those of the LOEO staff and do not necessarily reflect the views of the Committee or its members.***

This report is the second in a series of four studies on Ohio's SchoolNet initiatives:

- Description of SchoolNet, SchoolNet Plus, and the Ameritech Agreement
- Ohio SchoolNet Initiatives: School Readiness for Computers and Networks
- Ohio SchoolNet Initiatives: The Role of the Ohio Education Computer Network
- Ohio SchoolNet Initiatives: Summary of LOEO Findings

SUMMARY

Ohio SchoolNet Initiatives: School Readiness for Computers and Networks

This report is the second in a series of Legislative Office of Education Oversight (LOEO) reports focusing on the SchoolNet initiatives. It examines the readiness of Ohio's schools to use the computers and wiring for networks provided by SchoolNet and SchoolNet Plus.

SchoolNet provides every Ohio public school classroom with wiring for at least one telecommunications connection to other classrooms in the same school. The capital bill of the 120th General Assembly provided $95 million for SchoolNet. The operating budget of the 121st General Assembly appropriated an additional $27 million to SchoolNet.

SchoolNet Plus plans to provide at least one interactive computer workstation for every five students enrolled in grades K-4. Schools may use some of the SchoolNet Plus funds for electrical upgrades, computer hardware, equipment, training and services, two-way audio or video equipment, software, or textbooks. The operating budget of the 121st General Assembly authorized $125 million for SchoolNet Plus. It was the intent of the original authorization that another $275 million would be proposed for the FY 1996-1998 capital budget.

As of April 12, 1996, the Ohio Department of Education received a total of 294 SchoolNet applications, of which 244 districts were approved and 50 are still awaiting approval. SchoolNet Plus received 449 applications; 367 were approved.

Expectations

Most of the legislators, state officials, and educators that LOEO interviewed during this study agree that SchoolNet and SchoolNet Plus are long-term investments. They provide schools some of the funding to establish an infrastructure for computer use and to purchase computers that otherwise would be unavailable to most. State officials maintain that computers and other forms of technology need to become tools to enhance teaching and learning rather than viewed as a supplement to the curriculum.

Educators agreed with state officials that in order for SchoolNet and SchoolNet Plus to have the desired effect on classroom practices, teachers must fully integrate computers and other technology into the curriculum. Educators differed slightly from state officials in only one area -- communication. More than anything else, educators stressed the role that computers and other technology will play in increasing communication between and among students, teachers, administrators, parents, and the entire community.

Approximately half of the schools in the LOEO sample are ready to use computers and networks.

Readiness

LOEO used national literature and data collected during 40 telephone interviews and 12 school visits to identify the strengths schools have, as well as the challenges they face, in preparing for technology. In order to determine the extent of these challenges and strengths across Ohio, LOEO mailed a questionnaire to a teacher or a principal in 500 randomly selected schools. Each responding school received a score in the areas of physical conditions, professional development, interest in computers, use of computers, technical assistance, and planning. Totals of each school's scores determined its overall readiness for computers and networks.

Approximately half (48%) of schools in the LOEO sample are ready to use computers and networks and approximately half (52%) are not ready. In schools that are ready, students and teachers will be capable of using computers and networks in the classroom immediately after installation of workstations and wiring. When we generalize from the LOEO random sample to the whole, we estimate that 1,760 of the 3,657 schools in Ohio are prepared to use computers and networks; approximately 1,900 are not ready.

In general, 36% of city schools, 44% of rural schools, and 65% of suburban schools are ready.

Socioeconomic conditions of a district and the age of buildings affect the readiness of schools. In general, 36% of city schools, 44% of rural schools, and 65% of suburban schools are prepared to use computers and networks in the classroom. In terms of age, 75% of schools built in the last twenty years are ready; only 48% of those older than twenty years are prepared.

Challenges and Strengths

As schools prepare for computers and networks, they most frequently face challenges in providing adequate electrical service, professional development, and technical assistance.

Approximately 90% of the schools not meeting the LOEO criteria for readiness need increased electrical service.

Electrical upgrades. The most widespread challenge is schools' need to improve electrical service -- that is, to increase both electrical power to the building and the number of outlets in each classroom. Schools can use up to 10% of their SchoolNet Plus funds to address their electrical needs.

Professional development. SchoolNet funds include $12.5 million for professional development grants. An additional $2.5 million has been appropriated for interactive instructional programming targeted toward the needs of the 200 poorest school districts in the state. Prior to this support, participation in professional development activities varied widely across the state. Approximately 13% of schools responding to the LOEO survey report that *all* teachers participated in some computer-related professional development activity during the last year; 15% report that two or fewer teachers participated. Reported obstacles to providing up-to-date staff development include lack of both money and time.

Professional development is both a money and time issue.

Technical Assistance. As teachers and students increase their computer use, the need for technical assistance rises. Networks necessitate having someone to do network administration. Yet, when asked if *anyone* is available to repair computer hardware, software, or network equipment, 27% of survey respondents said, "No." Only 7% of survey responses indicate that someone serves their buildings full time; other schools either share technical support services or depend on the intermittent availability of a classroom teacher.

For 27% of the schools surveyed, no one is available to repair computer hardware, software, or network equipment. Only 7% have someone serving their school fulltime.

Interest in computers. Support received from teachers, administrators, and the community for computers is directly proportional to the school's success at integrating computers into the classroom. Approximately 93% of the survey respondents report that teachers want computers for student use. Administrative support for computers is very high -- 98% of the respondents report that principals strongly support computers for student use, and 96% report strong support by district-level administration. Community support is slightly less -- 80% report a high level of community support for computers in classrooms.

Acquisition and current use of computers. Schools need the computers that will be supplied by SchoolNet and SchoolNet Plus. Only 23% of survey respondents report that *all* classrooms in their school currently have at least one computer. Most teachers in their schools use computers in the classroom. Approximately 79% of respondents report that teachers go beyond using computers only for administrative purposes.

Although most teachers no longer use computers strictly for administrative tasks, reinforcement exercises, or as a reward for students who complete their "regular" coursework, they are slow to adopt some of the more complex uses of computers. Few survey respondents report that most teachers in their schools use computers in complex ways.

Only 29% say most teachers encourage students to use computers to explore subjects; only 25% say most teachers encourage students to use computers as a research tool; and only 18% say most teachers encourage students to use computers to design their own projects.

Planning. To participate in SchoolNet and SchoolNet Plus, ODE requires schools to have in place extensive technology plans. LOEO found that the majority of school districts in Ohio either have technology plans in place or are in the process of developing them.

LOEO Comments

The General Assembly has already appropriated more than $240 million for SchoolNet initiatives. There is no clear cut, "one-size-fits-all" solution to the need for electrical upgrades. LOEO recognizes that several approaches to this problem are possible; each has potential consequences and issues to consider.

Possible actions include:

1) The General Assembly, in cooperation with the Governor's office and Ohio businesses, could create a "Re-wire Ohio" effort to muster local support for electrical upgrades.

2) The General Assembly could take no additional action. Given that the legislature already has appropriated $240 million state dollars for computers and networks, it could expect school districts to provide the electrical infrastructure to use them.

3) The General Assembly could provide some additional funds for one-time electrical upgrades.

SchoolNet and SchoolNet Plus will provide Ohio schools with up-to-date computers. The need for acquisition of computers will not end with the first provision of computers in each classroom. Computers quickly become outdated -- many two-year-old units will not support the most recent software. Schools must address their ongoing need for upgrades.

In order to use the computers provided by these initiatives, teachers need extensive professional development. The General Assembly could make it easier for districts to provide time for professional development by amending section 3313.48 of the Revised Code to provide technology in-service days. To do so, they must designate using days from the 182-day school year or lengthen it.

Teachers need not only professional development, but also day-to-day technical assistance. Technical assistance for teachers using computers is a new field. As computers become integrated not just into classrooms, both the need for technical assistance and the supply of people to provide it will change.

Finally, SchoolNet and SchoolNet Plus are new, fast-moving initiatives. Up to $522 million in state dollars and an undetermined amount of local funds could be spent to provide computers and networks to schools. A statewide evaluation of SchoolNet and SchoolNet Plus is needed to determine the effects of these expenditures.

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CHAPTER I

Introduction

This report is the second in a series of Legislative Office of Education Oversight (LOEO) reports focusing on the SchoolNet initiatives. The first report, a description of SchoolNet, SchoolNet Plus, and the Ameritech Agreement, is available from LOEO. This report examines the readiness of Ohio's schools to use the computers and networks provided by the SchoolNet initiatives. A third report will focus on advantages and disadvantages of using the existing Ohio Education Computer Network for telecommunication connections. A final report will summarize LOEO's information on these initiatives.

Background

SchoolNet provides the wiring for at least one telecommunications connection to every public school classroom throughout the state. SchoolNet wiring allows for voice, video, and data transmission. The purpose of the wiring is to connect classrooms *within* each building. SchoolNet does not pay for connections to computers or information services beyond the building.

SchoolNet was authorized $95 million in Amended House Bill 790, the capital appropriation act of the 120th General Assembly. Of that $95 million, $50 million is to wire all 100,000 classrooms throughout the state and $45 million is to purchase computers and related technology for the low-wealth school districts.

In Amended Substitute House Bill 117, the operating budget of the 121st General Assembly, an additional $27 million was appropriated to SchoolNet for professional development grants and interactive instructional programming.

SchoolNet Plus was authorized $125 million in Amended Substitute House Bill 117. The goal of SchoolNet Plus is to provide at least one interactive computer workstation for every five students enrolled in grades K-4. It was the intent of the original legislation that an additional $275 million be authorized in the FY 1996-1998 capital bill. Schools may use some of the SchoolNet Plus funds for electrical upgrades, computer hardware, equipment, training and services; two-way audio or video equipment; software; and textbooks.

Participation in SchoolNet and SchoolNet Plus is voluntary. To participate, school districts must develop or have in place technology plans that identify strategies for using technology to improve teaching and learning. School districts have until 1999 to submit applications for SchoolNet. Completed SchoolNet and SchoolNet Plus applications must be submitted to the Ohio Department of Education (ODE) to be reviewed by evaluation teams from around the state. There are no established deadlines by which school districts must spend the money provided through SchoolNet and SchoolNet Plus.

Through Amended Substitute House Bill 117, the General Assembly also authorized an increase in funding for the Ohio Education Computer Network (OECN). The OECN, with its 24 regional sites, was originally developed for *administrative* purposes. Through this network, school districts electronically transmit information to ODE on costs, students, and staff as part of the Education Information Management System (EMIS). The OECN now anticipates serving the *instructional* purposes of schools by supplying teachers and students access to on-line computer services via connections to the state computer network.

Current status of SchoolNet and SchoolNet Plus

As of April 26, 1996, ODE received a total of 306 SchoolNet applications of which 251 were approved and 55 are still awaiting approval. Fourteen prototypes include 37 districts and represent different configurations of urban, suburban, and rural schools. These prototypes serve as examples for the implementation of SchoolNet.

Wiring is complete or currently being installed in:

- 3,486 classrooms in low-wealth districts;
- 2,596 classrooms in prototype districts; and
- 6,369 classrooms in all other districts.

As of May 10, 1996, the state contractor has finished installing SchoolNet wiring in 3,885 classrooms.

Funds have purchased:

- 1,995 workstations in low-wealth districts; and
- 641 workstations in prototype districts.

In terms of SchoolNet Plus, 449 applications have been received; 367 were approved. Since February 1996, $82.7 million in SchoolNet Plus awards have been distributed to eligible school districts. Exhibit 1 summarizes the funding for SchoolNet initiatives.

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Exhibit 1

Funding for SchoolNet and SchoolNet Plus

Initiative	Authorizing Legislation	Amount Appropriated	Encumbered to Date
SchoolNet	Am. H.B. 790, Capital Appropriations FY 1994-1996 Am. Sub. H.B. 117, Operating Appropriations FY 1995-1997	$95 million $27 million	$11.5 million N/A
SchoolNet Plus	Am. Sub. H.B. 117, Operating Appropriations FY 1995-1997 Capital Appropriations Bill FY 1996-1998	$125 million $275 million (Intended to be introduced)	$82.7 million N/A

Methods

LOEO reviewed the national literature to identify the attributes that schools need as they prepare for technology. A selected bibliography is in Appendix A. In addition, LOEO conducted telephone interviews with 40 teachers and administrators and visited 12 schools. Interview questions are found in Appendix B.

LOEO used the literature and interviews to identify the strengths schools have as well as the challenges they face in preparing for technology. In order to determine the extent of these challenges and strengths across Ohio, LOEO mailed a questionnaire to 250 teachers and 250 principals in 500 randomly selected schools. The random

sample represents schools of different socioeconomic conditions, geographic regions of the state, and grade levels.

LOEO received 316 responses. Of these, 307 were useable, although 21 had some missing items. LOEO gave each responding school an individual score in the areas of physical conditions, professional development, interest in computers, use of computers, technical assistance, and planning. These individual scores were then summed for a total score to determine a school's overall readiness for computers and networks. An explanation of the scoring method is found in Appendix C.

LOEO also used the socioeconomic comparison groups developed by ODE to explore whether challenges and strengths were more concentrated in particular kinds of districts. A description of these groups is found in Appendix D and the LOEO survey is in Appendix E.

* * * * * *

What are policymaker and educator expectations of SchoolNet and SchoolNet Plus?

LOEO interviewed eight state officials, including legislators and executive branch administrators, as well as 63 teachers and administrators from school districts throughout the state, to learn about their expectations of SchoolNet and SchoolNet Plus. Though specific responses varied, the overall expectations of what will happen in schools and classrooms as a result of computers and networks were the same. The following is a summary of those expectations.

State officials

State officials agree that SchoolNet and SchoolNet Plus are long-term investments. They provide schools the funding to establish an infrastructure for computer use and to purchase computers that otherwise would be unavailable.

Beyond the equipment and wiring provided by SchoolNet and SchoolNet Plus, teachers and students will have access to information that allows them to compete in a technology-oriented society.

State officials believe that computers are not a fad, but instead a new direction that will transform *how* schools deliver education. They are familiar with education research and reform objectives and see technology as a means to allow teachers to become more facilitators of learning than lecturers. Teachers will be able to manage the learning of several groups of students within the same classroom and in other buildings.

In addition to group learning activities, technology enables teachers to provide students with more tailored instruction. With a more independent and self-guided approach to instruction, students can progress at their own levels. Teachers can identify when a student is having difficulty and intervene with individualized instruction. It is the hope that technology will assist in converting a student's role from a passive learner to an active learner.

State officials maintain that computers and other forms of technology need to become tools to enhance teaching and learning rather than viewed as a supplement to the curriculum. To achieve that, teachers must participate in the intensive training necessary to learn how to fully integrate technology into the curriculum. If implemented properly, the use of technology will result in a complete "climate" change.

Distance learning is an example of technology transforming education. It changes the way teachers manage student learning and gives students the opportunity to broaden their educational experiences. Students are able to explore cultures and subjects that otherwise would be unavailable to them.

One of the biggest fears cited by state officials is that computers and other technology will not be used at all or not used in a way that makes students active learners. For that reason, they believe it is imperative for teachers to get the intensive training they need to learn how to fully integrate technology into the curriculum.

Teachers and administrators

Overall, educators agreed with state officials that in order for SchoolNet and SchoolNet Plus to have the desired effect on classroom practices, teachers must fully integrate computers and other technology into the curriculum. Educators recognize that for this to take place, the role of the teacher must change significantly.

Like state officials, educators view the role of the teacher changing from the "sage on the stage" to the "guide on the side" where teachers manage learning rather than provide information. Classrooms will become learning centers where students work collaboratively in groups or independently. This will allow students to work at their own levels with their preferred working styles. It also helps teachers identify any problems students are having in a particular area and intervene as necessary.

Educators anticipate the inequities that result when requiring *all* students to progress at the same pace will be resolved when technology provides opportunities for students to work at a style and pace that meets their own needs.

Some examples given by educators of how technology can be properly integrated were the use of CD-ROM packages and the Internet. Both allow students to do research, learn about new areas of study, or explore other cultures. Teachers can use computers and other technology for "cross-curriculum integrations" where students work on projects that incorporate several subject areas.

Educators differed slightly from state officials in their expectations in only one area -- communication. More than anything else, educators stressed the role that computers and other technology will play in increasing communication between and among students, teachers, administrators, parents, and the entire community.

Through the use of computers and other technology, the confinement and relative isolation of the classroom will no longer exist. Teachers will be able to share ideas and lesson plans with teachers in other buildings and districts through e-mail.

The one area that excites educators most is the impact that computers and other technology will have on communication between home and school. For families who have access to e-mail, communication will increase. Teachers will be able to forward students' assignments when they are absent and parents will be able to receive timely feedback on their child's progress.

CHAPTER II

School Readiness for Computers and Networks

How many Ohio schools are ready for computers and network wiring?

LOEO investigated this question in response to legislators' concerns that SchoolNet and SchoolNet Plus funds might purchase equipment and pay for wiring that schools are unprepared to use.

Approximately half (48%) of schools in the LOEO sample are ready to use computers and networks. That is, students and teachers will be capable of using computers and networks in the classroom immediately after installation of workstations and wiring. When we generalize from the LOEO random sample to the whole, we estimate that 1,760 of the 3,657 schools in Ohio are prepared to use computers and networks.

LOEO criteria

LOEO considers schools "ready" when they have multiple strengths and no more than one weakness among the following:

- electrical wiring and building conditions;
- interest and support for computers in classrooms;
- professional development for teachers;
- computer use by teachers;
- software and hardware maintenance;
- support for network activities in classrooms; and
- technology planning.

SchoolNet requirements

The SchoolNet Office within ODE has the responsibility to ensure appropriate distribution of computers and wiring. Districts must submit plans that outline how they will prepare for computers and networks. According to ODE's Components of a SchoolNet Application:

> *To receive SchoolNet funding, school districts are required to submit a technology plan that identifies strategies and tactics that will improve teaching and learning in their schools.*

The 12-page application must be accompanied by:

- a local school board resolution supporting the district's participation;
- a technology plan;
- a wiring fact sheet; and
- a proposed timeline.

The application must address staff development needs; planning and management; the provision of technology that meets a wide range of student and teacher needs; planned configuration of computers and networks; connections to the outside world; and a plan for acquiring additional equipment.

The SchoolNet Plus application is similar, but requires the district to include any plans to use SchoolNet Plus money for electrical upgrades.

The SchoolNet application does not require districts to meet all of LOEO's criteria for readiness prior to receiving wiring. However, technology plans are expected to include how districts will eventually meet them. For example, a district could have provided very limited computer-related professional development in the past year, and as a result, not met LOEO's criteria for readiness. Yet its technology plan could include extensive teacher inservice for the coming year and be approved.

Administrators that LOEO interviewed said that their schools and districts would use SchoolNet Plus funds to address some of the issues of readiness discussed in this report. The statewide plan for implementation of SchoolNet includes a five-year timeline.

A district's receipt of SchoolNet money is no guarantee that an individual school will receive workstations or be wired. Some district technology plans focus activities in only some of the district's schools. Large districts must schedule wiring and workstation installation in many schools, and do so around the classes and students already in the buildings.

Finally, although districts are required to evaluate their own implementation of SchoolNet initiatives, any systematic statewide evaluation of results of this implementation is still in a very early planning stage.

* * * * *

Which schools are ready for computers and networks?

LOEO investigated whether geographic location, age of school buildings, age of students served, and ODE socioeconomic comparison groups affected overall readiness for computers and networks.

Geography

Location of schools does not affect overall readiness. That is, no geographic area of the state has a particularly high or low concentration of schools that are prepared for computers and networks.

Age of schools

Readiness for computers and networks is a problem for all but the few, newest schools; that is, those less than 20 years old. In these newer schools, 75% are ready. However, for the 90% of schools in the LOEO sample that are over 20 years old, only 48% are ready. This 48% figure applies across different ages of buildings. It is true for those 20, 40, 60, 80, or even 100 years old.

Grade level

The age of children served by schools has only a slight effect on overall readiness -- 51% of elementary, 46% of middle and junior high, and 48% of high schools are prepared for computers and networks.

Comparison groups

When LOEO compares schools using ODE socioeconomic comparison groups, some differences in overall readiness appear. These differences are most easily observed when comparison groups are combined to represent city, rural, and suburban areas. In cities, 36% of schools are prepared to use computers and networks in the classroom. In rural areas, 44% of schools are prepared; and in the suburbs, 65% are prepared.

CHAPTER III

Challenges Schools Face as They Prepare To Use Computers and Networks

What challenges prevent schools from being prepared for computers and networks?

Using survey responses, LOEO estimates that approximately half (52%) of Ohio schools are not ready to use computers and networks immediately upon installation. When we generalize from the LOEO random sample to the number of schools in Ohio, approximately 1,900 of 3,657 schools are not ready.

These schools have more than one major problem to overcome before they are ready to use computers and networks. Even schools that are ready face challenges in the areas of electrical service, professional development, and technical assistance.

*Approximately half of the schools in the LOEO sample are **not** ready to use computers and networks.*

Electrical upgrades

The most widespread challenge for schools as they prepare for computers and networks is their need to improve electrical service -- that is, to increase both electrical power to the building and the number of outlets in each classroom.

Approximately 60% of all survey responses indicate that they need improvements in electrical service before installation of computers. When we generalize from the LOEO random sample to the state as a whole, we estimate that 2,250 of 3,657 schools across Ohio need electrical upgrades.

Of schools that did *not* meet LOEO criteria for readiness, 90% indicate a need for increased electrical service. Even among schools that LOEO describes as ready for computers and networks, 36% must increase their electrical service.

Approximately 90% of the schools not meeting the LOEO criteria for readiness need increased electrical service.

During site visits and interviews, superintendents, technology coordinators, architects, district maintenance personnel, and district business managers stressed the need for electrical upgrades. They explained the limited capacity of their schools' electrical systems or the lack of wall outlets in classrooms will prevent the use of computers. For every computer, monitor, and printer in a classroom, there must be an outlet. There must be adequate power provided to the school, so that if students or teachers turn on more than one computer, the lights do not dim or disappear.

For example, a technology coordinator in one district explained that in most of the buildings, the only way to ensure adequate power for one computer, monitor, and printer is to unplug other electrical devices. In one school, built in 1928, electrical wiring is limited to a single lightbulb in each classroom. The office has a few wall outlets, but the staff cannot turn on the copy machine without unplugging the refrigerator. The coordinator suggested that a computer in this setting would remain unplugged most of the day.

Although this example may appear to be an extreme case, the challenge of meeting electrical needs of schools across the nation and in Ohio is well documented. In April 1995, the U.S. General Accounting Office issued a report, School Facilities: America's Schools Not Designed or Equipped for 21st Century. This report cites that 46% of the nation's schools have electrical wiring that is insufficient for computer technology and 35% of the nation's schools have electrical power that will not support computer technology.

Specific to Ohio, the 1990 Ohio Public School Facility Survey states that 46% of the state's school buildings need repair or replacement of electrical systems merely to meet state building code provisions. That report also reveals that more than 40% of Ohio's school buildings were built before 1940, when electrical wiring supported lighting needs and little else.

Replacing electrical systems is an expensive process. Although SchoolNet Plus funding allows elementary schools to use up to 10% of this money for electrical upgrades, middle- and high-school educators expressed uncertainty about how they will meet these costs.

Beyond the cost of electrical system upgrades, some schools must remove asbestos before they can rewire. The 1990 Ohio Public School Facility Survey estimates that 68% of Ohio schools still have unremoved asbestos.

A superintendent stated that recent remodeling of one elementary building cost the district more than $2 million, about $1.5 million of which paid for "invisible" improvements. These included providing electrical infrastructure and removing asbestos. He said, "These upgrades are behind the walls and a lot of people don't see them and wonder what the money was spent on." He explained that invisible improvements lead to taxpayer resentment and withdrawal of support for subsequent levies.

A future LOEO report will include information on the cost and kinds of upgrades needed.

Other physical conditions of school buildings

During site visits and telephone interviews, administrators and teachers mentioned other physical conditions that would prevent installation of computers and networks: space for computers, lack of air conditioning, presence of asbestos, leaking roofs, and the overall conditions of buildings. Yet, survey responses indicate that some of these challenges are not widespread.

For schools that report their building conditions will prevent installation of computers and networks:

- **57%** lack air conditioning;
- **35%** need classroom space;
- **14%** need to improve overall conditions of the building;
- **11%** have leaky roofs; and
- **7%** must remove asbestos.

Professional development

Nearly everyone interviewed during this project agreed that professional development is a crucial component of preparation for computers and networks. The 1992 Ohio Department of Education's State Plan for Technology describes the need for professional development:

> *Professional development is the most important vehicle for integrating current technologies into educational programs. With the proliferation of new technologies, there is an increasing need for all educators to understand not only the mechanics of the materials and equipment, but the assumptions implicit in their use.*

Developers of SchoolNet and SchoolNet Plus acknowledge the importance of professional development and require each technology plan to include a professional development strategy.

SchoolNet funds provided by the FY 1995-1997 operating budget include $12.5 million for professional development grants. These grants will be awarded to Regional Professional Development Centers, universities, public television stations, media centers, and educational service centers (formerly county boards of education) to improve the use of educational technology in the classroom. An additional $2.5 million has been appropriated for interactive instructional programming targeted toward the needs of the 200 poorest school districts in the state.

The SchoolNet office will use $1.8 million to offer professional development to 10,000 teachers. This training will use a "train the trainer" approach. That is, each teacher who participates in SchoolNet's professional development is expected to provide assistance and training to other teachers in his district.

The current statewide picture of professional development for computer and network skills is not as grim as that of electrical needs. LOEO telephone interviews, site visits, and survey responses show that the current state of professional development is full of "good news/bad news" stories. Still, professional development is a statewide challenge.

Participation in professional development activities varies widely across the state. Approximately 13% of schools responding to the LOEO survey report that *all* teachers participated in some computer-related professional development activity during the last year; 15% report that two or fewer teachers participated. However, most schools are somewhere in between: 50% indicate that half or more of the teachers participated in some computer-related professional development activity.

Survey results indicate limited availability of professional development throughout schools in Ohio. Only:

- **7%** have an adequate amount of professional development;
- **25%** require teachers to have basic computer skills; and
- **51%** have professional development available for teachers at various levels of expertise.

The availability of professional development and the needs of individual teachers vary not only across the state but within each school and district. A superintendent of a small-city school district said:

> *Some of the teachers have a master's degree in technology; others don't even want to touch a computer. Overall, the level of staff development will need to be mixed.*

Survey data suggest that districts and schools are attempting to respond to these varied needs -- 53% of respondents indicate that staff development has gone beyond providing teachers with instruction in basic skills. This more advanced staff development helps teachers use computers in a specific curriculum area or encourages them to expand student use of computers.

For example, a school technology coordinator described an inservice session:

> *Our staff development will not say 'This is how you turn on the computer,' but 'If you are now using a specific software for displaying science experiment data, here are many more ways that you can get the kids to use it to understand that data.'*

He explained that any teachers who need to learn how to turn on the computer would learn that skill as part of learning the application of the science software.

Approximately 59% of survey responses indicate that inadequate funds are available for professional development. Administrators and teachers interviewed by phone described that, in addition to funds, finding time for teachers to participate is a problem. A principal from an urban district wondered where she could find substitutes for her teachers who were out of the classroom for computer instruction.

A principal summarized, "Inservice is a money and time issue. When do we get time to provide inservice to teachers on technology issues?"

Administrators and teachers discussed challenges to providing up-to-date staff development. Software and skills are current for only a short time. New software and hardware improvements demand constant attention. Delivery of inservice sessions must be timely -- a session teaching a specific software in August is both outdated and forgotten if the software is not used until January.

> ***We can't do it piecemeal, it must be dedicated time on task. It is better to pay teachers to come in summer, or after school. Teachers have to be able to experiment, and once the kids are here, the teachers are too busy to acquire new knowledge.*** *-- a principal*

Schools use a variety of strategies and resources for providing professional development. Survey responses indicate that:

- **2%** use district resources;
- **53%** use resources within their schools;
- **35%** use colleges and universities;
- **31%** use Regional Professional Development Centers;
- **28%** use private vendors; and
- **18%** use regional sites of the Ohio Educational Computer Network.

Other resources mentioned are parent volunteers, county education service centers, and public television stations.

As noted, slightly more than 28% of survey respondents state that teachers in their schools have participated in professional development provided by private vendors. During one site visit, a superintendent praised the professional development services provided by a private vendor. His district purchased a "package deal," that is, the district contracted with a vendor to provide computers, technical assistance, all needed additional equipment, network wiring, software, and extensive professional development. Over the course of the 1995-1996 school year, the vendor provided five to six full days of professional development for each teacher. At the time of our site visit, teachers of primary grades had participated in an initial two-day introduction, and their students were using computers as part of each day's learning activities.

Approximately 31% of survey respondents indicate that teachers in their schools have used Regional Professional Development Centers (RPDCs) for professional development activities. The RPDCs have offered ongoing opportunities for teachers to learn about computers, networks, and SchoolNet.

As of May 2, 1995, RPDCs were providing sessions about SchoolNet, after-school classes for teachers, and professional development teams to coordinate technology training across districts.

> ***If the legislature wants to help make this possible, they should require four or six tech training days every year . . . for at least the first few years of SchoolNet. Increase early release days to let there be more half-days, or reduce to 175 student days with five tech days.*** -- a superintendent.

Technical assistance

Computers seldom arrive at a school ready to be plugged into the wall and used. Someone must connect several components of each workstation with cables and wires, install software, and make sure the teachers and students have some basic understanding of the mechanics of operating each software program.

Further, as teachers and students increase the incorporation of computer and network use into their day-to-day activities, the need for technical assistance rises. Even the best software has some inevitable glitch; even the best hardware is fallible. As networks become more common, network administrators will become indispensable members of district and school staffs.

During site visits, teachers stressed the importance of having someone in the building whose primary responsibility is technical assistance to teachers. One elementary building in an urban district was very well equipped with networked computers. Federal grant moneys paid the salary for a technical advisor for three previous years. Teachers and administrators attributed the successful integration of computers into the classroom to the day-to-day availability of a technical assistant.

This year, federal grant money is no longer available to this building. Although the district now pays the salary of the technical assistant, she has been transferred to another school. Teachers and other staff miss her presence. One teacher wondered if their use of computers would slowly diminish as unresolved software and hardware glitches become more frequent. District staff is available to help these teachers, but access to the district staff is limited and waiting periods for resolution of problems are long.

When asked if *anyone* is available to repair computer hardware, software, or network equipment, 27% of survey respondents said, "No." Only 7% of survey responses indicate that someone serves their buildings full time; other schools either share technical support services or depend on the intermittent availability of a classroom teacher.

The availability of someone to occasionally assist with computers and networks is not the same as having someone with full-time responsibility for them. Having someone in the building to respond to problems is not the same as having someone whose presence must be scheduled. When assistance is intermittent, students or teachers must delay use of a malfunctioning workstation or software.

For 27% of the schools surveyed, no one is available to repair computer hardware, software or network equipment. Only 7% have someone serving their school full time.

Seventy-five percent of survey respondents indicate that salaries of people to maintain computers and networks receive less-than-adequate funding. During site visits, district administrators elaborated on the cost issues.

One small-city district was unsuccessful in finding someone to fill a technical assistant position. The superintendent said that the issue was a combination of limited availability of qualified applicants and low salary. Few applicants have both the experience with schools and the technical skills required, and those who do would not consider working for the salary the district is offering. The superintendent realizes that he needs to convince the school board that the position is worth the $50,000 salary necessary to attract qualified applicants.

A large, poor-urban district faces slightly different problems. It struggles to retain the technical assistants it has. A district administrator worries that the district will soon be losing its best technology coordinator as suburban districts lure her away with a higher salary.

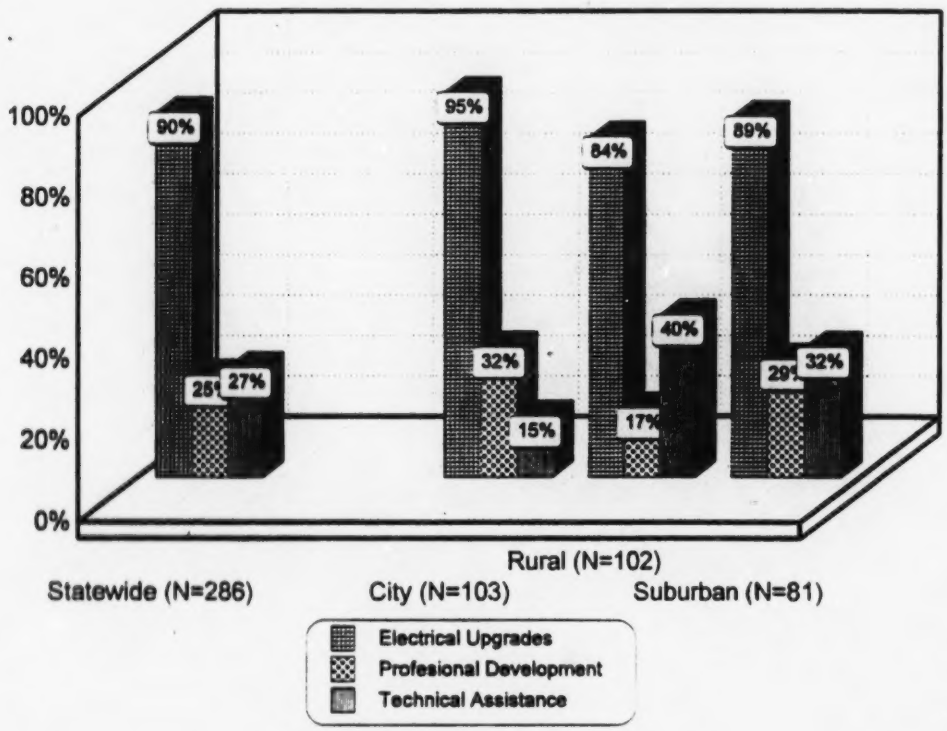
Are challenges concentrated in any type of district?

Electrical challenges

LOEO analyzed differences among socioeconomic comparison groups using three factors that most often made schools "unready." These factors include electrical upgrades, professional development, and technical assistance. Exhibit 2 shows differences in the frequency of these challenges among city, rural, and suburban schools that are not ready.

Exhibit 2

Challenges for Schools that Are Not Ready

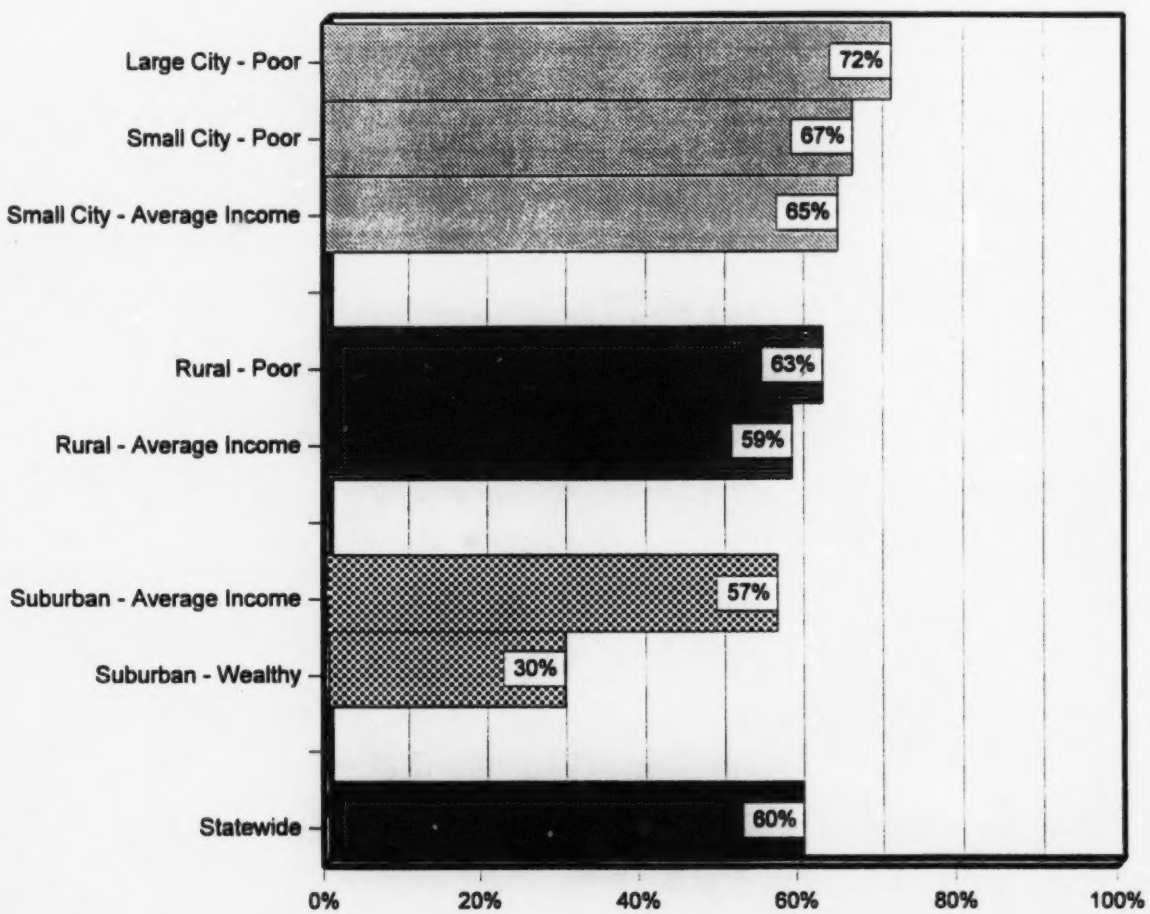


The need for electrical upgrades is the biggest factor contributing to unreadiness in all kinds of schools -- statewide, 90% of unready schools face this obstacle. A lack of professional development contributed to unreadiness in 32% of city and 29% of suburban districts. Approximately 40% of rural and 32% of suburban districts need to improve technical assistance.

Even among schools that meet the LOEO criteria for readiness, challenges exist. When we examine both ready and unready schools together, the three comparison groups comprised of large and small city schools have greater needs for electrical upgrades than other kinds of districts. Large cities have the highest concentration of schools with electrical needs; wealthy suburbs, the lowest. Exhibit 3 displays the need for electrical upgrades in all schools, both ready and unready.

Exhibit 3

Percent of Schools Needing Electrical Upgrades



When we generalize from the LOEO random sample to the state as a whole, we can estimate the total number of Ohio schools that need electrical upgrades. Exhibit 4 presents this analysis for each comparison group and the whole state. In effect, about 60%, or a total of 2,248 schools across Ohio, need electrical upgrades to use computers and networks.

Exhibit 4

Estimated Number of Ohio Schools Needing Electrical Upgrades

Socioeconomic Comparison Group	Percent in LOEO Sample Needing Upgrades	Total Number of Ohio Schools in this Group	Estimated Number of Ohio Schools Needing Upgrades
Large City - Poor	72%	717	518
Small City - Poor	67%	313	209
Small City - Average Income	65%	550	358
Rural - Poor	63%	231	144
Rural - Average Income	59%	1,014	601
Suburban - Average Income	57%	615	353
Suburban - Wealthy	30%	217	65
Statewide	60%	3,657	2,248

Professional development challenges

Schools in poor large cities are also the most likely to have weak professional development. LOEO considers professional development weak if, in the last year, only one or two teachers participated and the focus of sessions was the basic operation of computers. Schools in wealthy suburbs are most likely to have strong professional development. LOEO considers professional development strong if, in the past year, all but one or two teachers participated and the focus of sessions was the integration of computers into the classroom.

Technical assistance challenges

Regarding technical assistance, the largest concentration of need is in rural districts -- 41% from poor rural districts and 26% from average-income rural districts completely lack technical assistance. Only 6% of large city schools indicate a total lack of technical assistance.

What other challenges affect schools' use of computers and networks?

Electrical upgrades, increased professional development, and the availability of technical assistance are not the only needs schools must address before they are ready for computers and networks.

Adequate and current computers

SchoolNet and SchoolNet Plus will address, in part, the need for computers in classrooms. SchoolNet provides computers to schools in poor districts; SchoolNet Plus provides them to elementary schools. Middle and high schools from average- and high-income districts, who will not receive workstations from these initiatives, still face the challenge of acquiring the computers that will make networks possible.

Site visits and telephone interviews convinced LOEO staff that many schools with classroom computers will need to update them. The current computers are often older models and will support neither modern software nor extensive network activities. Others who have investigated technology in Ohio schools discuss the need for replacement of older equipment. For example, Project Equity, the 1993 report of the State of Ohio Education Technology Equity Commission, states:

> *By the extraordinarily large margin of 88%, the teachers of the State of Ohio believe that their school buildings need more computers. This perceived inadequacy is even better understood when we realize that substantial proportions of existing computer equipment across all strata consist of arguably obsolescent computers such as Apple, Commodore and Amiga machines.*

Connections beyond the school building

SchoolNet provides connections among classrooms only within the school building. It does not link classrooms in one building to those in another, nor does it link classrooms to a central office. It does not create a connection to the Internet or any information service.

If teachers and administrators want their students to use computers and networks for communication beyond their own building, their schools must create telecommunications connections and find some way to pay for them.

During interviews, district administrators and technology coordinators remarked on problems associated with connections beyond their buildings. Administrators who anticipated using an expanded Ohio Education Computer Network (OECN) for these connections expressed concern that the system would not support their needs. Others, whose districts used or were considering using commercial telephone companies, commented on the *extremely* high ongoing cost. An upcoming LOEO report will explore the advantages and disadvantages of using the OECN connection.

Funding

SchoolNet and SchoolNet Plus combined are projected to provide more than $500 million to schools. In spite of this large allocation of state funds, school administrators said that the lack of both state and local funds interferes with preparation for computers and networks. Some administrators said they have chosen to rearrange their current budgets to prepare for computers and networks. Other administrators said that school districts must constantly work to maintain their current levels of local support.

Increases in state and local funds are seldom available to address issues of upgrading electrical systems, providing extensive professional development, or hiring full-time technical assistants. Sixty percent of survey respondents cite insufficient funds for one or more components of readiness.

Administrators recognize that local or state funding increases are unlikely. Many realize that their districts must make hard choices. To provide the necessary support for computers and networks, they must economize in other areas. Middle or high schools with average or above average income are ineligible for workstations through either SchoolNet or SchoolNet Plus. In order to use the networks provided by SchoolNet, these schools must find funds to purchase computers and other hardware associated with networks.

Grants from private foundations and the federal government or partnerships with businesses play a critical role in a school's ability to prepare for computers and networks. A superintendent said, "Districts without . . . grants can't even hope to do this kind of [technical] connection."

One example of the effect of grants on school readiness is the increased incidence of readiness among the recipients of Tech Equity grants. Tech Equity grants were created to assist low-wealth district or consortia in acquiring tools and skills necessary for the integration of technology. Districts can use Tech Equity to fill gaps in the infrastructure needed to support computers and networks.

Fifteen recipients of Tech Equity grants responded to the LOEO survey. This number is not large enough to come to confident conclusions; however, data from this limited sample suggest that schools who received Tech Equity grants are more likely to be ready for computers and networks than the general population of schools -- 66% of this group are ready compared to 48% statewide. The data also suggest Tech Equity schools are less likely to require electrical upgrades -- only 33% of Tech Equity schools in our sample need electrical upgrades.

LOEO did not collect information that could be used to determine whether the activities funded by Tech Equity grants contribute to readiness or if the increase in readiness is associated with being a school that pursues and qualifies for grants.

CHAPTER IV

Strengths of Schools as They Prepare for Computers and Networks

What are schools' strengths in preparing for computers and networks?

Despite challenges, Ohio schools have many strengths to build upon as they prepare for computers and networks. Survey responses indicate a strong foundation already in place for schools to move toward the installation and integration of computers and networks. The three areas where Ohio schools demonstrate a high level of success include: interest in computers and networks, current use of computers and networks, and planning.

Interest in computers and networks

In his 1994 document, Technology Integration in K-12: A Consideration of Issues and Obstacles, Hofmeister states:

> *Anyone involved with the integration of technology into K-12 schools knows that perhaps the most significant difficulty in this area is the resistance by teachers to accept and use technology in their regular classes.*

Throughout LOEO's review of literature pertaining to the successful integration of computers and networks, the one area that researchers consistently agreed upon as the most crucial component of readiness is interest and support.

During site visits and interviews, school administrators, teachers, and technology coordinators frequently conveyed to LOEO the importance of interest and support for computers and networks within their schools. Both teachers and administrators described the level of support a school receives from teachers, administrators, parents, and extended community members as being directly proportional to the school's success. Support ranges from interest in the use of computers by teachers and students to financial support.

One district LOEO visited received over $1 million from its local telephone company to purchase fiber optic lines, equipment, and technical support for a computer learning lab. The company also donated monthly telephone line fees and surcharges through the year 2000. In addition to the financial support of the telephone company, the superintendent, several principals, and maintenance staff wired the secondary schools on weekends and evenings.

Overall, teachers support computers and networks in their classrooms. For teachers throughout Ohio schools, the emphasis is on first getting the computers, then having them networked.

Approximately 93% of the survey respondents report teachers demonstrating a high level of interest in computers for student use. When asked about teacher desire for networks:

- **84%** report that teachers have a strong interest in computers networked *within* the school building; and
- **75%** state that teachers have a strong interest in computers networked *beyond* the school building.

Administrative support for computers is very high:

- **98%** of the respondents report that principals strongly support computers for student use; and
- **96%** report strong support by district-level administration.

Community support is slightly less -- **80%** report a high level of community interest in computers.

LOEO found very little difference in interest levels for computers when clustering by ODE comparison groups. Respondents falling within the suburban and urban comparison groups report virtually the same level of interest in computers, while schools falling within the rural comparison groups rank slightly higher. There is no difference at all between any of the comparison groups with respect to their interest in networks.

Computer presence

In order for teachers to fully integrate computers into the curriculum, they must first have access to them. Access to computers goes beyond one instructional period per day or week when teachers are permitted to use a group of computers in a lab down the hall. If teachers are going to fully integrate computers into the curriculum, they must have an adequate number of computers at their disposal throughout the course of the day.

In Technology Integration in K-12, Hofmeister concludes that:

> *Although technology can be used to support the lectures and demonstrations of the teacher, there is a definite tendency for their use to extend beyond this level, especially if the computers are in classrooms or in spaces open to student use rather than in networked labs designed for Computer Assisted Instruction -- the standard drill and practice method.*

LOEO asked survey respondents to report the number of classrooms in their school with at least one computer. Only 23% report that *all* classrooms in their school have at least one computer, whereas 60% report that half or more of the computers in their school are in a lab. Despite the scarcity of computers in classrooms, 79% of the survey respondents indicate that half or more of the teachers in their school are using computers in some capacity.

> **The growth in the number of computers in K-12 schools over the last 15 years has been phenomenal. In 1981 only 18 percent of public schools had one or more computers in the building; in 1991, that number has grown to 98 percent and in 1994 it is hard to find a school without a single computer** -- J. Hofmeister

Schools that are prepared for computers and networks must still ensure the acquisition of an adequate number of computers. Not all schools that meet LOEO's criteria for being "ready" have computers in each classroom. Only 36% of Ohio's schools meet the readiness criteria above and have at least one computer in half or more of their classrooms. The remaining schools will need to acquire workstations for classrooms.

Relocating computers from labs to classrooms gives teachers the access they need to move beyond basic computer use to more complex applications. Teachers are more likely to integrate computers into their curriculum plans and students are more likely to use them for complex projects if computers are accessible. But, simply moving computers from the lab to the classroom will not solve the problem completely. Teachers need training on *how* to progress to more complex applications.

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Computer use

If the ultimate goal of providing computer technology to schools is to increase the higher order thinking skills of students, then the use of technology by students must move in that same direction. Teachers must move away from the basic "drill and practice" use of computer technology to the more complex use where students are involved in multi-disciplinary exercises using realistic examples and data.

Survey respondents report most teachers in their schools have begun to incorporate computers into the classroom:

- **79%** report that most teachers go beyond using computers only for administrative purposes;
- **75%** report that most teachers allow students access to computers during class time; and
- **55%** report that most teachers use computers for more than student drill.

Survey responses also indicate that although teachers have progressed to the point where they are no longer using computers strictly for administrative tasks, drill exercises, or as a reward for students who complete their "regular" coursework, they are slow to adopt some of the more complex uses of computers. Few survey respondents report that most teachers in their schools use computers in complex ways:

- **29%** say most teachers encourage students to use computers to explore subjects;
- **25%** say most teachers encourage students to use computers as a research tool; and
- **18%** say most teachers encourage students to use computers to design their own projects.

A principal interviewed by LOEO described his school's current approach to the use of computers as a "blend." Each student has one hour per week in the computer lab where 40 minutes is spent on drill exercises and 20 minutes is spent on activities to develop higher order thinking skills.

Planning

To participate in SchoolNet and SchoolNet Plus, ODE requires districts to have extensive technology plans. LOEO found that the majority of school districts in Ohio either have technology plans in place or are in the process of developing them.

During site visits and telephone interviews, LOEO found technology planning to run the gamut. Planning varies from school districts who are just beginning to create a plan to those who have had complete, long-term technology plans for more than 10 years. In between are districts who submitted documents that barely meet SchoolNet and SchoolNet Plus planning standards and need the assistance of the Regional Professional Development Centers (RPDCs) to improve their plans.

Technology planning is as unique as the school district itself. In some school districts, a select group of teachers and administrators develops a technology plan, while other districts involve members of the community.

Approximately 98% of the survey respondents report that their district has been working on or has completed a technology plan within the last three years. When broken down by ODE comparison groups, LOEO found urban school districts to be slightly farther behind in their planning than rural and suburban school districts. This may suggest that the size of urban school districts mandates more extensive planning than needed by suburban and rural school districts.

CHAPTER V

Conclusions and LOEO Commentary

More than half of Ohio's schools (52%) are not immediately ready to use the computers and networks that are available through SchoolNet and SchoolNet Plus. Virtually all of the unready schools need upgrades in their electrical capacity or an increase in the number of electrical outlets. Other obstacles to readiness vary among city, suburban, and rural districts. City schools frequently have trouble providing adequate professional development; rural schools lack technical assistance. Although suburban schools are frequently ready, those schools who are not have problems with both technical assistance and professional development.

Electrical upgrades

The need to upgrade electrical service is the most pervasive challenge that Ohio schools face as they prepare for computers and networks. It is also the most prohibitive. Without adequate power, wiring, and outlets, schools can not use computers. This obstacle affects all types of school districts, except some in the wealthiest suburbs.

To address this problem, elementary schools can use up to 10% of their SchoolNet Plus funds for electrical upgrades; schools serving low-wealth populations are eligible for other state and federal grants. Wealthy districts have, or should have, the local resources to upgrade their electrical service. It is the middle and high schools from average income districts that have the greatest need to reallocate existing or find additional funds to address the need for increased electrical service.

> ***LOEO Comments:*** The General Assembly has already appropriated more than $240 million for SchoolNet initiatives with another $275 million being considered for the FY 1996-1998 Capital Appropriations Bill. Yet, the statewide problem of schools with inadequate electrical infrastructure has the potential to limit the effectiveness of these initiatives. There is no clearcut, "one-size-fits-all" solution to the need for electrical upgrades. LOEO recognizes that several approaches to this problem are possible; each has potential consequences and issues to consider.
>
> Possible Actions:
>
> 1) The General Assembly, in cooperation with the Governor's office and Ohio businesses, could create a "Re-Wire Ohio" effort to muster local support for electrical upgrades. The "Re-Wire Ohio" effort could include:
>
> - a statewide public service campaign to inform the public of the value of the SchoolNet initiatives and the need for related electrical upgrades. Such a high-profile campaign can help ease local resistance to levies and remind local business and industry of the importance of their support;

- getting local businesses, electrical contractors, and technical colleges to participate in a wiring campaign similar to California's recent "Net Day." During "Net Day", participants donated their time and skills as they rewired schools;

- organizing local pools of assistance, such as Business Advisory Councils, to help districts find and obtain private sector funding; and

- ODE helping individual districts determine if they can reallocate some of their existing funds. ODE's recently developed "Expenditure Flow Model" may be a useful tool in this effort.

Consequences: Some state expenditure will be needed to support the publicity and coordination effort but the cost for the electrical upgrades will come from non-state sources.

2) The General Assembly can take no additional action. Given that the General Assembly already has appropriated $240 million for computers and networks, it could expect school districts to provide the electrical infrastructure to use them.

Consequences: Student access will not be universal; equity issues will persist. Most suburban schools will be able to use existing electrical infrastructures or upgrade them as needed. Many schools in cities and rural districts will delay or limit use of the computers and networks.

3) The General Assembly could provide some additional funds for one-time electrical upgrades. Sources for these funds include:

- non-education items in the operating budget;
- other education items in the operating budget; and
- the budget stabilization ("rainy day") fund.

Consequences: Funding for ongoing programs or for emergency needs is diminished.

Acquisition of current computers

Ohio has several strengths upon which schools can build as they incorporate or increase computer and network use. Interest is very strong and most teachers use computers in some capacity. Twenty-three percent of schools report having at least one computer in each classroom.

However, computers quickly become outdated. Many of those currently in classrooms lack the power to support network use or new software. Further, 77% of schools do not yet have one computer in each classroom.

SchoolNet provides computers for low-income schools. SchoolNet Plus is designed to provide one up-to-date workstation for every five students in grades K through 4 in all districts. Using funds from the FY 1995-1997 budget bill, SchoolNet Plus has approved requests for computers to 367 districts. If the General Assembly fully funds the $275 million in the FY 1996-1998 capital bill for SchoolNet Plus, the initiative will be able to provide the planned number of computers to all districts.

> ***LOEO comments*:** The need for acquisition of computers will not end with the first provision of computers in each classroom. Computers quickly become outdated -- many two-year-old units will not support the most recent software. Schools must address their ongoing need for upgrades.
>
> This creates a quandary for the General Assembly. In planning for SchoolNet Plus, the General Assembly included using $275 million in bond money from the upcoming capital bill. If the General Assembly uses bond money for computers, the computers are assets that depreciate rapidly in value and may be completely obsolete by the time the bonds are paid off. Yet, if the General Assembly does not fully fund SchoolNet Plus, elementary students in some schools will have limited access to computers.

Professional development

Although many schools have begun to provide computer-related professional development, they seldom meet this need adequately. The SchoolNet initiatives allocate money to, and require districts to plan for, professional development. However, money is "necessary but not sufficient." Time for teachers to participate in professional development activities is scarce. In many city districts a lack of substitutes makes it difficult to schedule any professional development activities during the school day.

> ***LOEO comments:*** The General Assembly could make it easier for districts to provide time for professional development by amending section 3313.48 of the Revised Code to provide technology in-service days. However, in order to do so, they must designate using days from the 182-day school year or lengthen the year. Either option will be unpopular with someone. Teachers already complain there is not enough time to complete the curriculum during the year. Parents, teachers, and administrators have opposed lengthening the school year in other states that have tried to do so.

Technical assistance

Technical assistance is often an obstacle. Only 7% of schools have a full-time staff person available within their building to help teachers with hardware or software problems, and 27% have no one available at all. The remainder have intermittent assistance; they either share technical support staff with other buildings or depend on the part-time help of their own teachers. People with the education experience and the necessary technical skills are in limited supply and in great demand. Therefore, salaries for qualified personnel to provide technical assistance are high.

LOEO comments: Technical assistance for teachers using computers is a new field. As computers become integrated, not just into classrooms, but across all facets of society, the need for people to service them will increase. As teachers become more comfortable and proficient at using computers, they will be able to solve many minor software problems that now seem overwhelming. However, new problems that emerge will be more complicated. The need for the continuous presence of an assistant may change, but will not diminish. Networks necessitate network administrators.

Evaluation

SchoolNet and SchoolNet Plus will provide computers and network wiring. In addition, the planning required for districts to participate will help schools to address many of the readiness issues discussed in this report. For example, a district's technology plan must include how it will provide professional development that will teach teachers to use computers. However, both legislators and taxpayers need reassurance that this massive investment results in the anticipated improvements in classrooms.

LOEO comments: A statewide evaluation of SchoolNet and SchoolNet Plus is needed to determine the effects of the initiatives. A statewide evaluation of the impact of SchoolNet and SchoolNet Plus on student learning is in the planning stage. Although it is important that the evaluation focus on student use of computers, it should also include the effects of implementing the initiatives on professional development and technical assistance. Further, statewide records of the kinds and number of computers and related equipment in each school should be compiled and updated annually, perhaps through the EMIS.

Appendices

Appendix A
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Appendix B
LOEO Telephone Interview Questions

Hello. My name is _____. I work for an office of the Ohio State Legislature. In 1994, the legislature voted to create a statewide communication network with all schools. This network is called SchoolNet. The state is providing communication wiring connections to all schools, and computer equipment to low-wealth schools. The communication wiring will create the ability of teachers and students to transmit video, telephone, and computer information. A second initiative, called SchoolNet Plus, will ensure that elementary schools will have one computer for each five children.

The goal of our telephone interviews is to create a list of conditions that might affect the ability of schools to use SchoolNet and SchoolNet Plus. We are interviewing teachers and administrators from selected schools throughout the state. Would you be willing to talk to us for 20 minutes about how your school might be affected by SchoolNet and SchoolNet Plus? When would be a good time for us to speak? (If later, you can offer to fax them questions, so they can prepare.)

For teachers:

1. Tell me a little bit about your school.

2. SchoolNet and SchoolNet Plus increase the number of computers in Ohio's classrooms. How should computers be used in the classroom?

3. The communication wiring will create the ability of teachers and students to transmit video, telephone, and computer information. How should the SchoolNet communication network be used in the classroom?

4. Is your school ready to use computers and SchoolNet communication network in the ways you just described? If not, how far away are you?

5. What changes need(ed) to be made before computers and SchoolNet communication network can be used as you described in question 2?

If not mentioned, probe for changes needed in:

a) Physical facilities of school
b) Additional equipment
c) Staff development/staff relationships
d) Administration
e) Curriculum and structure of school day
f) Management
g) Funding

6. You mentioned several changes that need to be made before computers and the SchoolNet communication network can fully benefit your school. Which of these is the most important?

For administrators:

1. Describe technology planning for your school or district.

2. To what extent is your school/district currently participating in School Net and SchoolNet Plus?

3. SchoolNet and SchoolNet Plus increase the number of computers in Ohio's classrooms. How should computers be used in the classroom?

4. The communication wiring will create the ability of teachers and students to transmit video, telephone, and computer information. How should the SchoolNet communication network be used in the classroom?

5. Is your school/district ready to use computers and the SchoolNet communication network in the ways you just described? If not, how far away are you?

6. What changes need(ed) to be made before computers and the SchoolNet communication network can be used as you described in question 2?

7. Who provides computerized school management services to your district? (OECN, district office, commercial service?)

8. What services are provided?

9. Describe the quality of the services.

10. Should this provider also supply your district with networking services for use by students? If so, why? If not, why not?

Appendix C
Legislative Office of Education Oversight (LOEO)
Criteria for Determining Readiness

In its survey of Ohio schools, LOEO assessed their readiness for computers and networks using eight components developed from research literature, site visits, and telephone interviews with teachers and administrators. LOEO set criteria for the components and then scored each response in terms of how it compared to that criteria. The following table lists the components and describes the criteria for obtaining the highest and lowest score. Additional information about the methods used in this study is available from LOEO.

Scoring by Major Categories

Component of Readiness	Highest Score	Lowest Score
Physical conditions in the school building that might prevent installation of computers	None will prevent installation of computers	Having electrical problems that would prevent installation of computers
Physical conditions in the school building that might prevent installation of networks	None will prevent installation of networks	Having more than two physical conditions to remedy prior to installation of networks
Professional development	All but one or two teachers participated in computer-related staff development, AND that development included a focus beyond basic operation of computers	Only one or two teachers participated in ANY computer-related staff development, AND for those who did, the focus was limited
Interest in computers	More than half of teachers, administrators, and community want or support computers for student use	Teachers, administrators, or community oppose or have no interest in computers
Interest in networks	More than half of teachers, administrators, and community want or support networks in the school for student use	Teachers, administrators, or community oppose or have no interest in networks in the school
Current use of computers	All (or all but one or two) teachers use computers in some capacity, and fewer than half use them mostly for administrative purposes	No teachers currently use computers
Technical assistance for staff	Someone is available to assist teachers with hardware, software, and timely repair of equipment	No one is available to assist teachers with hardware or software
Planning	Plan in place or undergoing development for 3 or more years	No plan started

Appendix D
ODE Socioeconomic Comparison Groups

The Ohio Department of Education (ODE) clusters school districts throughout the state as a means to compare school districts with similar socio-economic characteristics. The four characteristics listed below were used to sort districts into seven comparison groups. The number of students and the percent of minority students were also considered in classifying urban school districts.

District Characteristics

Average family income; all residents
Percent of students from families receiving Aid for Dependent Children
Percent of total assessed property value designated agricultural
Per-pupil commercial tax base; nonresidential, nonagricultural

Ohio Department of Education's seven comparison groups:

Group 1:	rural, average income
Group 2:	rural, poor
Group 3:	suburban, average income
Group 4:	small city, poor
Group 5:	large city, poor
Group 6:	suburban, wealthy
Group 7:	small city, average income

Appendix E
LOEO Questionnaire

Opportunities and Obstacles for Using Computers

YOUR HELP WITH THIS EFFORT IS GREATLY APPRECIATED!!!

This survey will provide us with a greater understanding of how computers will be used in schools throughout Ohio We ask that you take the time to answer the following questions to the best of your ability. Please choose or fill in the response that best fits your school.

Current Physical Conditions	
1. How old is your school building?	_____ Years
2. Will any of the following prevent installation of computers in your school building (check all that apply):	___ a. inadequate number of electrical outlets in individual classrooms ___ b. insufficient electrical power throughout the building ___ c. inadequate classroom space for workstations ___ d. presence of asbestos in walls or ceilings ___ e. lack of air conditioning ___ f. leaking roofs ___ g. overall condition of the building ___ h. other (please specify) _____
3. Will any of the following prevent installation of computer network wiring in your school building?	___ a. inadequate building space for network equipment, such as servers ___ b. presence of asbestos in walls or ceilings ___ c. lack of air conditioning ___ d. leaking roofs ___ e. overall condition of the building ___ f. other (please specify) _____

Interest in Computers						
4. How many teachers in your school want computers for student use in their classrooms?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
5. How many teachers in your school want computers networked within the school building?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
6. How many teachers want computers networked beyond the school building?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
7. What portion of the community supports computers for student use?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
8. What is the level of principal support of computers for student use?	Strong opposition		Some opposition	Indifferent	Some support		Strong support
9. What is the level of district administration support of computers for student use?	Strong opposition		Some opposition	Indifferent	Some support		Strong support

Professional Development

10. Have colleges provided recently hired graduates in your school adequate preparation in how to use computers for instruction?
    No | Somewhat adequate | Yes | No recent grads

11. Is the development of basic computer skills mandatory for teachers in your school?
    No | Yes

12. Are professional development opportunities available for teachers with various levels of computer expertise?
    No | Meets some needs | Yes

13. Is there support for motivated teachers to attend conferences and workshops related to the use of computers?
    No | For some teachers | Yes

14. How many teachers participated in staff development related to the use of computers since January 1, 1995?
    None | One or two | Fewer than half | Half | More than half | All but one or two | All

15. What is the typical number of hours teachers participating in staff development spent on computer-related topics?
    _____ Hours _____ Don't know

16. Since January 1, 1995, was the amount of time teachers spent in computer-related staff development adequate?
    No | For some teachers | Yes

17. Professional development attended by your school's teachers since January 1, 1995, include: (check all that apply)
    - ___ a. how to operate computers
    - ___ b. focus on a curriculum subject, yet incorporated computer use as a tool for teaching that subject
    - ___ c. focus on several "tools" for teaching, one of which was computers
    - ___ d. use of computers by students
    - ___ e. use of networks

18. What sources of computer-related staff development were used by teachers in your school since January 1, 1995? (check all that apply)
    - ___ a. regional Professional Development Centers
    - ___ b. colleges and universities
    - ___ c. OECN data acquisition sites
    - ___ d. my school district
    - ___ e. my school
    - ___ f. private vendors
    - ___ g. other _____

Current Use of Computers							
19. How many classrooms in your school have at least one computer?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
20. How many computers in your school are located in a lab?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
21. How many teachers in your school use computers in some capacity?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
(If the answer to #21 is "None," proceed to #34)							
22. How many teachers in your school use computers mostly for administrative purposes (such as attendance, lesson plans, grades, etc.)?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
23. How many teachers in your school use computers as a way to provide drills for students?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
24. How many teachers in your school restrict student use of computers to "free time?"	None	One or two	Fewer than half	Half	More than half	All but one or two	All
25. How many teachers in your school encourage students to use computers to explore subjects in greater depth?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
26. How many teachers in your school encourage students to use computers to design their own projects?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
27. How many teachers in your school encourage students to use computers as a tool for research?	None	One or two	Fewer than half	Half	More than half	All but one or two	All
28. Has the use of computers caused changes in the structure of the school day?		No				Yes	

Staff Assistance	
29. Is there currently someone available to repair computer hardware, software, or network equipment?	No Yes
30. If yes, the person is:	____ a. fulltime and serves only this school ____ b. parttime for our school because of responsibilities for serving additional schools ____ c. parttime in addition to teaching or administrative duties within this building ____ d. from a private company ____ e. other _____
31. Is there currently someone available to install, maintain, and train staff to use new software?	No Yes
32. If yes, the person is:	____ a. fulltime and serves only this school ____ b. parttime for our school because of responsibilities for serving additional schools ____ c. parttime in addition to teaching or administrative duties within this building ____ d. from a private company ____ e. other _____
33. Is broken equipment repaired in a timely manner?	No Yes

Planning and Funding	
34. The district technology plan:	___ a. has been ongoing for more than 3 years ___ b. has been completed within the last 3 years ___ c. is in the process of being developed ___ d. will be developed in the future ___ e. other (please specify) _____
35. Which computer-related area receives less-than-adequate or no funding? (check all that apply)	___ a. computer-related professional development ___ b. maintenance of computer-related equipment ___ c. replacement of old computer-related equipment ___ d. salary of a person to maintain computers, networks, and other computer-related equipment ___ e acquisition of computers ___ f. acquisition of computer-related equipment ___ g. other (please specify) _____ ___ h. none ___ i. don't know

You and Your School		
36.	Are you a:	___ a. principal ___ b. teacher ___ c. other (please specify) _____
37.	How long have you been an educator?	_____ year(s)
38.	What are the grade levels in your school?	_____
39.	If you are a teacher, what grade(s) do you teach?	_____
40.	If you are a middle- or high-school teacher, what subject(s) do you teach?	_____ _____

Please mail the completed survey in the enclosed stamped envelope
by February 16, 1996.

Thank You